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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/542,407	07/15/2005	Keiko Kushibiki	040302-0472	3450

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FOLEY AND LARDNER LLP
SUITE 500
3000 K STREET NW
WASHINGTON, DC 20007

EXAMINER

CANTELMO, GREGG

ART UNIT	PAPER NUMBER
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1795

MAIL DATE	DELIVERY MODE
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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/542,407	Applicant(s) KUSHIBIKI ET AL.	
	Examiner Gregg Cantelmo	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-14 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-14 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 July 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____. |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>7/15/05; 7/27/06</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

2. The information disclosure statements filed July 15, 2005 and July 27, 2006 have been placed in the application file and the information referred to therein has been considered as to the merits.

The information disclosure statement filed July 15, 2005 fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the information referred to therein has not been considered. No foreign documents other than JP 11-026004 have been received. Thus all other foreign document citations have not been considered since there are no copies of these documents.

Note: regarding the ISR citation the Examiner disagrees with the interpretation of the U.S. prior art cited therein as applied to at least claim 1. Neither U.S. Patent Nos. 5,097,103 (Schramm), 5,866,090 (Nakagawa) or U.S. Patent No. 4,921,765 (Gmeindl) teach of the claimed fuel vaporizer as recited in claim 1. Therefore these references are not held to anticipate claim 1 or any of those claims which are dependent upon claim 1.

Claim Rejections - 35 USC § 112

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The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claim 3 is rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for the cathode exhaust gas flow passage of the CO₂ separator communicating with the cathode exhaust gas flow passage (see Fig. 1 and paragraph bridging pages 6 and 7 of the specification), does not reasonably provide enablement for the cathode exhaust gas flow passage of the CO₂ separator communicating with the anode exhaust gas flow passage. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make or use the invention commensurate in scope with these claims. It appears that the claimed communication should be commensurate with the disclosure as recited in the paragraph bridging pages 6 and 7 and claim 3 has been interpreted in light of the specification to mean that the cathode exhaust gas flow passage of the CO₂ separator communicating with the cathode exhaust gas flow passage. This rejection applies to claims 4-11 all of which are dependent upon claim 3.

4. Claims 1-14 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for the fuel cell being a solid oxide fuel cell, does not reasonably provide enablement for claiming a generic fuel cell. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make the invention commensurate in scope with these claims. It appears that the CO₂ separator of the claimed and disclosed invention functions based

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on temperature of the exhaust gas and carrier gas passing through the separator.

These temperatures range as described in the specification. As discussed in detail in the specification, the SOFC is the only fuel cell system disclosed which operates in a range equal or great than about 600 degrees Celsius and equal to or less than 1000 degrees Celsius. Thus it would appear that only SOFCs provide the necessary conditions under which the CO₂ separator effectively operates. Therefore it is suggested that the independent claims be amended to recite that the fuel cell is a solid oxide fuel cell to overcome this rejection.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 1-14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1-14 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential elements, such omission amounting to a gap between the elements. See MPEP § 2172.01. The omitted elements are: that the fuel cell is a solid oxide fuel cell. It appears that the CO₂ separator of the claimed and disclosed invention functions based on temperature of the exhaust gas and carrier gas passing through the separator. These temperatures range as described in the specification. As discussed in detail in the specification, the SOFC is the only fuel cell system disclosed which operates in a range equal or great than about 600 degrees Celsius and equal to or less than 1000 degrees Celsius. Thus it would appear that only SOFCs provide the

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necessary conditions under which the CO₂ separator effectively operates. Therefore it is suggested that the independent claims be amended to recite that the fuel cell is a solid oxide fuel cell to overcome this rejection.

Claim 12 recites the limitation "the cathode exhaust gas flow passage of the carbon dioxide separator" in lines 2-3, "the carbon dioxide removing member" in line 4. There is insufficient antecedent basis for these limitations in the claim.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 13 and 14 rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,097,103 (Schramm).

Schramm discloses a fuel cell system comprising: a fuel cell having a fuel electrode A supplied with fuel gas and an air electrode K supplied with oxidizer gas; carbon dioxide separating means W for separating carbon dioxide from anode exhaust gas expelled from the fuel electrode of the fuel cell; and fuel injecting means for injecting fuel into the anode exhaust gas which is recycled back to the anode A, whose carbon dioxide is separated in the carbon dioxide W separating means and which is expelled therefrom, to produce gas, with the fuel gas produced by the fuel injecting means being supplied to the fuel electrode A of the fuel cell (Fig. 1 as applied to claim 13). Schramm also teaches of a method of circulating gas in a fuel cell

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system provided with a fuel cell having a fuel electrode A supplied with fuel gas and an air electrode K supplied with oxidizer gas, the method comprising: separating carbon dioxide from anode exhaust gas expelled from fuel electrode A of a fuel cell in separating means W; producing fuel gas by injecting fuel into the anode exhaust gas which is mixed in a common inlet fuel line to the anode A, whose carbon dioxide is separated and which is expelled; and supplying the fuel gas into the fuel electrode of the fuel cell via common inlet line to the anode A (Fig. 1 and method of operating the system of Fig. 1 as applied to claim 14).

7. Claims 13 and 14 rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,866,090 (Nakagawa).

Nakagawa discloses a fuel cell system comprising: a fuel cell having a fuel electrode 27 supplied with fuel gas and an air electrode 28 supplied with oxidizer gas; carbon dioxide separating means 31 for separating carbon dioxide from anode exhaust gas expelled from the fuel electrode of the fuel cell; and fuel injecting means for injecting fuel into the anode exhaust gas which is recycled back to the anode 27, whose carbon dioxide is separated in the carbon dioxide 31 separating means and which is expelled therefrom, to produce gas, with the fuel gas produced by the fuel injecting means being supplied to the fuel electrode 27 of the fuel cell (Fig. 5 as applied to claim 13). Nakagawa also teaches of a method of circulating gas in a fuel cell system provided with a fuel cell having a fuel electrode 27 supplied with fuel gas and an air electrode 28 supplied with oxidizer gas, the method comprising: separating carbon dioxide from anode exhaust gas expelled from fuel electrode 27 of a fuel cell in

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separating means 31; producing fuel gas by injecting fuel into the anode exhaust gas which is mixed in a common inlet fuel line to the anode 27, whose carbon dioxide is separated and which is expelled; and supplying the fuel gas into the fuel electrode of the fuel cell via common inlet line to the anode 27 (Fig. 5 and method of operating the system of Fig. 5 as applied to claim 14).

8. Claims 13 and 14 rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 3,615,839 (Thompson).

Thompson discloses a fuel cell system comprising: a fuel cell having a fuel electrode 24 supplied with fuel gas and an air electrode 26 supplied with oxidizer gas; carbon dioxide separating means 32 for separating carbon dioxide from anode exhaust gas expelled from the fuel electrode of the fuel cell; and fuel injecting 14 for injecting fuel into the anode exhaust gas which is recycled back to the anode, whose carbon dioxide is separated in the carbon dioxide 32 separating means and which is expelled therefrom, to produce gas, with the fuel gas produced by the fuel injecting means being supplied to the fuel electrode of the fuel cell (Fig. as applied to claim 13). Thompson also teaches of a method of circulating gas in a fuel cell system provided with a fuel cell having a fuel electrode 24 supplied with fuel gas and an air electrode 26 supplied with oxidizer gas, the method comprising: separating carbon dioxide from anode exhaust gas expelled from fuel electrode of a fuel cell in separating means 32; producing fuel gas by injecting fuel into the anode exhaust gas into fuel mixer in which is mixed in a common inlet fuel line to the anode, whose carbon dioxide is separated in separator 32 and which is expelled; and supplying the fuel gas

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into the fuel electrode of the fuel cell via common inlet to the anode (Fig. and method of operating the system of applied to claim 14).

9. Claims 13 and 14 rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 6,986,957 (Landreth).

Landreth discloses a fuel cell system comprising: a fuel cell having a fuel electrode 112 supplied with fuel gas and an air electrode 114 supplied with oxidizer gas; carbon dioxide separating means 138 for separating carbon dioxide from anode exhaust gas expelled from the fuel electrode of the fuel cell; and fuel injecting 126 for injecting fuel into the anode exhaust gas which is recycled back to the anode, whose carbon dioxide is separated in the carbon dioxide 138 separating means and which is expelled therefrom, to produce gas, with the fuel gas produced by the fuel injecting means being supplied to the fuel electrode of the fuel cell (Fig. 1 as applied to claim 13). Landreth also teaches of a method of circulating gas in a fuel cell system provided with a fuel cell having a fuel electrode 112 supplied with fuel gas and an air electrode 114 supplied with oxidizer gas, the method comprising: separating carbon dioxide from anode exhaust gas expelled from fuel electrode of a fuel cell in separating means 138; producing fuel gas by injecting fuel into the anode exhaust gas into fuel mixer in which is mixed in mixing valve 118 and supplied to the anode, whose carbon dioxide is separated in separator 138 and which is expelled; and supplying the fuel gas into the fuel electrode of the fuel cell via common inlet to the anode (Fig. 1 and method of operating the system of applied to claim 14).

Claim Rejections - 35 USC § 103

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The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

10. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,475,655 (Nakanishi) in view of either Schramm, Nakagawa, Thompson or Landreth.

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Nakanishi discloses a fuel cell system comprising: a fuel cell 6 having a fuel electrode supplied with fuel gas and an air electrode supplied with oxidizer gas; and a fuel vaporizer 2 producing fuel gas which is then injected into the anode exhaust gas (non-reacted gas), and the fuel gas produced by the fuel vaporizer comprising fuel from the methanol tank 5 and non-reacted gas being supplied to the fuel electrode of the fuel cell (Fig. 1 as applied to claim 1).

Nakanishi does not teach of providing a CO₂ separator (claim 1).

The concept of providing a carbon dioxide separator in the anode exhaust line where the anode exhaust is recycled back to the anode fuel inlet is well known in the art as taught by either Schramm, Nakagawa, Thompson or Landreth.

The motivation for incorporating the CO₂ separator is to remove any unwanted carbon dioxide from the recycled unused fuel gas.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Nakanishi by incorporating a CO₂ separator as taught by either Schramm, Nakagawa, Thompson or Landreth since it would have removed any unwanted carbon dioxide or excess carbon dioxide from the recycled unused fuel gas.

11. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S.

Patent Application Publication No. 2002/0114988 (Iwasaki) in view of JP 63-166158-A (JP '158).

Iwasaki discloses a fuel cell system comprising: a fuel cell 9 having a fuel electrode supplied with fuel gas and an air electrode supplied with oxidizer gas; and a

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fuel vaporizer 3 producing fuel gas which is then injected into the anode exhaust gas (non-reacted gas), and the fuel gas produced by the fuel vaporizer comprising fuel from the fuel tank 1 and recycled gas (via recycle line 10) being supplied to the fuel electrode of the fuel cell (Fig. 1 as applied to claim 1).

Iwasaki does not teach of providing a CO₂ separator (claim 1).

The concept of providing a carbon dioxide separator in the anode exhaust line where the anode exhaust is recycled back to the anode fuel inlet is well known in the art as taught by JP 63-166158 (abstract).

The motivation for incorporating the CO₂ separator is to remove any unwanted carbon dioxide from the recycled unused fuel gas.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Iwasaki by incorporating a CO₂ separator as taught by JP '158 since it would have removed any unwanted carbon dioxide or excess carbon dioxide from the recycled unused fuel gas.

12. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Iwasaki in view of JP '158 as applied to claim 1 above, and further in view of U.S. Patent No. 5,866,090 (Nakagawa).

The difference not yet discussed is of the CO₂ separator having a CO₂ removing member that absorbs and releases CO₂ dependent upon the temperature of the gas where CO₂ is to be removed (claim 2).

Nakagawa teaches of a regenerative CO₂ separator in Fig. 1 which includes parallel gas flows on opposite sides of the partitioned separator. One gas flow 4 is the

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effluent wherein the CO₂ is absorbed from the effluent on one side and carried about the rotating separator to carrier gas 5 wherein the high temperature side causes CO₂ to be released from the rotating separator and into the carrier gas (Fig. 1 and col. 17, line 5 through col. 18, line 67 as applied to claim 2).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Iwasaki in view of JP '158 by modifying the CO₂ separator as suggested by either Nakagawa or Goto since it would have provided a compact and efficient design for removing CO₂ from an effluent and into a carrier gas.

Allowable Subject Matter

13. Claim 3 may be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 1st and 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

Reasons for allowable subject matter is based on the suggested interpretation of claim 3 above, notably the cathode exhaust gas flow passage of the CO₂ separator communicating with the cathode exhaust gas flow passage.

If true, then none of the prior art of record are held to reasonably teach the invention of at least claim 3. For example, the cathode exhaust gas flow passage of the CO₂ separator communicating with the cathode exhaust gas flow passage.

Nakagawa appears to be the closest prior art of record however the CO₂ separator communicates with the cathode inlet passage which is then supplied to the fuel cell. The claimed invention has both the anode exhaust and cathode exhaust

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communicating through the CO₂ separator. Thus the flow structure of the prior art of record does not appear to teach the claimed flow structure of claim 3 nor does the prior art of record suggest or fairly obviate the configuration of claim 3. Claims 4-11, dependent upon claim 3, are allowable for at least the reason set forth above.

14. Claim 12 may be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 1st and 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims. None of the prior art of record are held to reasonably teach the invention of at claim 12. For example, the presence of a gas combustor in the cathode exhaust gas flow passage of the CO₂ separator provided upstream of the CO₂ removing member and a portion of the anode exhaust gas is supplied to the combustor.

Nakagawa appears to be the closest prior art of record however Nakagawa fails to teach, suggest or fairly obviate the configuration of claim 12. None of the remaining prior art of record are held to reasonably teach, suggest or fairly obviate the invention of claim 12 as well. Thus, pending clarification of the outstanding 112 issues to claim 12, claim 12 may be allowable.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregg Cantelmo whose telephone number is 571-272-1283. The examiner can normally be reached on Monday to Thursday, 8:30-6:30.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Gregg Cantelmo/
Primary Examiner, Art Unit 1795